

### **REMARKS**

Claims 11-13, 16-19, and 22-24 are pending in the above-identified application. Support for the changes to claim 11 is found in original claim 4 as well and in Example 2 described at page 22 of the specification, and Figure 2. Support for the changes to 16 is found in the same portions of the original disclosure as noted above with regard to claim 11, as well as in original claim 9. Support for our new claim 24 is found in the Experiments in Tables 1 and 2 as described at pages 19-22 of the Specification.

#### **Issues under 35 USC 102(b) and 103(a)**

Claims 11, 12, 14 and 15 have been rejected under 35 USC 102(b) as being anticipated by Wang (Wang, "Concentration quenching of Eu<sup>2+</sup> in SrO-A1<sub>2</sub>O<sub>3</sub>:Eu<sup>2+</sup> phosphor", Journal of Luminescence, Volume 97, Issue 1, April 2002, Pages 1-6).

Claim 13 have been rejected under 35 USC 103(a) as being unpatentable over Wang in view of Chen (Chen, "Effect of host compositions on the afterglow properties of phosphorescent strontium aluminate phosphors derived from the sol-gel method," J. Mater. Res., Vol. 16, No. 5 May 2001, pp 1293-1300).

Claims 16 and 20 have been rejected under 35 USC 103(a) as being unpatentable over Wang in view of Xu (Xu, "Synthesis of SrAl<sub>2</sub>O<sub>4</sub> and SrAl<sub>2</sub>O<sub>3</sub> via ethylenediaminetetraacetic acid precursor," Materials Chemistry and Physics Volume 98, Issue 1, available online 26 September 2005, Pages 51-54).

Claims 17-19 and 21 have been rejected under 35 USC 103(a) as being unpatentable over Wang in view of Xu, and further in view of Douy (Douy, "Crystallisation of spray-dried amorphous precursors in the SrO-A1<sub>2</sub>O<sub>3</sub> system: a DSC study," Journal of the European Ceramic Society 23, 2003, pp 2075-2081).

Claims 22 and 23 have been rejected under 35 USC 103(a) as being unpatentable over Wang in view of Xu and Douy, and further in view of Ono '708 (US 2001/0054708).

All of the above-noted rejections are traversed based on the following reasons.

### Present Invention

The aluminate phosphor of the present invention exhibits a strong and maximum wavelength peak at about 410 nm by ultraviolet excitation, as shown in Fig. 2, as well as the result obtained at 1400°C shown in Fig. 5. The aluminate phosphor of the present invention exhibits advantageous emission color properties by varying the temperature of the heat treatment, though the general composition formula of the compound remains the same. The blue phosphor of the present invention having a maximum peak length at about 410 nm is obtained when the aluminate represented by  $7(\text{Sr}_{1-x}\text{Eu}_x)\text{O} \cdot y\text{Al}_2\text{O}_3$  ( $0 < x \leq 0.5$ ,  $1 < y \leq 36$ ) is heated at 1400°C in a reducing atmosphere, whereas a blue-green phosphor having a maximum peak length at about 510 nm is obtained when the aluminate of the same composition formula is heated at 1200-1350°C in a reducing atmosphere. This is evident from a review of Fig. 5 of the present application.

### Distinctions over Cited References

Wang discloses an aluminate phosphor represented by the general composition formula:  $\text{Sr}_{1-x}\text{Eu}_x\text{O} \cdot \text{Al}_2\text{O}_3$  ( $0.01 \leq x \leq 0.124$ ). The phosphor of Wang does not emit blue light having a maximum peak wave length at about 410 nm by ultraviolet excitation. In the emission spectra of Wang, though two emission bands are observed at 415 and 516 nm, the maximum peak wavelength is clearly at 516 nm (Wang, Fig. 1(b) and §3.1). In Wang, the peak strength at 415 nm is much lower than that at 516 nm, and the peak at 415 nm is observed at a low level only when the value of x is 0.106. In Wang, since the aluminate phosphor is obtained by calcining the aluminate  $\text{Sr}_{1-x}\text{Eu}_x\text{O} \cdot \text{Al}_2\text{O}_3$  ( $0.01 \leq x \leq 0.124$ ) at 1300°C in a reducing atmosphere (Wang, §2), the aluminate phosphor of Wang emits green-blue light having a maximum peak wave length at 516 nm by ultraviolet excitation.

Wang fails to disclose or suggest conducting the heat treatment at about 1400°C to obtain the aluminate phosphor of the present invention. This is a surprising discovery made by the inventors of the present application that the emission color of the phosphor can be varied according to the temperature of the heat treatment. Consequently, significant patentable

distinctions exist between the present invention and Wang, such that the rejections based on this reference should be withdrawn.

Xu discloses  $\text{SrAl}_2\text{O}_4$  and  $\text{SrAl}_{12}\text{O}_{19}$  as aluminates, but fails to disclose how to obtain  $\text{SrAl}_2\text{O}_4$  and  $\text{SrAl}_{12}\text{O}_{19}$  aluminates that emit blue light. Xu fails to disclose or suggest varying the emission color of  $\text{SrAl}_2\text{O}_4$  based on the heat treatment temperature. Further,  $\text{SrAl}_{12}\text{O}_{19}$  is not included in the aluminate of the present invention represented by  $7(\text{Sr}_{1-x}\text{Eu}_x)\text{O} \cdot y\text{Al}_2\text{O}_3$  ( $0 < x < 0.5$ ,  $1 \leq y \leq 36$ ), since the value of  $y$  in  $\text{SrAl}_{12}\text{O}_{19}$  is calculated to be 42. Regarding  $\text{SrAl}_2\text{O}_4$ , though the value of  $y$  for  $\text{SrAl}_2\text{O}_4$  is calculated to be 7, the calcining temperature to obtain  $\text{SrAl}_2\text{O}_4$  is  $1300^\circ\text{C}$  or less, not  $1400^\circ\text{C}$  as in the process of the present invention. Consequently, significant patentable distinctions exist between the present invention and Xu, such that the rejections based on this reference should be withdrawn.

The additional references cited in support of the above rejections, i.e. Chen, Douy and Ono '708, are farther removed from the present invention and all fail to make up for the deficiencies of the Wang and Xu references discussed above. Thus, the rejections based on these references should also be withdrawn.

It is submitted for the above reasons that the present claims define patentable subject matter such that the present application should be placed into condition for allowance.

If the Patent Examiner has any questions regarding the above matters, please contact Applicant's representative, Andrew D. Meikle, in the Washington Metropolitan area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

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